IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Before the Board of Patent Appeals and Interferences

Ex Parte:	GAILUS, PAUL
Application Number:	09/933,364
Filing Date:	August 20, 2001
Title:	A Feedback Loop With Adjustable Bandwidth
Group:	2614
Examiner:	LISA HASHEM

BRIEF ON BEHALF OF APPELLANTS UNDER 37 CFR 41.37

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I. REAL PARTY IN INTEREST

The name of the real party in interest for purposes of this appeal is Motorola, Inc., a Delaware corporation.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to the Applicant, the Applicant's legal representative, or assignee which would directly affect or be directly affected by or having a bearing on the Board's decision in this pending appeal.

III. STATUS OF CLAIMS

Claims 3, 10, 19 and 21 have been cancelled. Claims 1, 2, 4-9, 11-18, 20 and 22 remain in the application. Claims 1, 2, 4-9, 11-18, 20 and 22 are being appealed. Claims 1, 2, 4-9, 11-18, 20 and 22 stand or fall together.

In a final Office Action dated May 17, 2006, the Examiner rejected: Claims 1, 8, 9, 11, 18 and 20 under 35 U.S.C. 102(b) as being anticipated by Wessel, et al. (USPN 6,275,685); Claims 2 and 4-6 under 35 U.S.C. 103(a) as being unpatentable over Wessel, et al. as applied to Claim 1, and further in view of Cahill (USPN 5,287,556); Claims 7 and 12 under 35 U.S.C. 103(a) as being unpatentable over Wessel, et al. as applied to Claim 1, and further in view of Wray, et al. (USPN 5,467,055); and Claims 13-17 and 22 under 35 U.S.C. 103(a) as being unpatentable over Wray, et al. in view of Wessel, et al.

IV. STATUS OF AMENDMENTS

No amendments to the claims have been made subsequent to the Final Office Action mailed May 17, 2006.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Although specification citations are inserted below in accordance with 37 C.F.R. § 41.37, these reference numerals and citations are merely examples of where support may be found in the specification for the terms used in this section of the brief. There is no intention to in any way suggest that the terms of the claims are limited to the examples in the specification. Although, as demonstrated by the reference numerals and citations below, the claims are fully supported by the specification as required by law, it is improper under the law to read limitations from the specification into the claims. Pointing out specification support for the claim terminology, as is done here to comply with rule 41.37, does not in any way limit the scope of the claims to those examples from which they find support. Nor does this exercise provide a mechanism for circumventing the law precluding reading limitations into the claims from the specification. In short, the reference numerals and specification citations are not to be construed as claim limitations or in any way used to limit the scope of the claims.

The invention, as defined in Claim 1 and with reference to FIG. 2, is a feedback loop (200) in an electrical device generating a variable output signal, the feedback loop for adjusting the variable output signal, the feedback loop having an input for receiving an input signal, an output for outputting the variable output signal and a loop bandwidth associated with a forward path and a feedback path of the feedback loop, the feedback loop comprising: a power amplifier

(231) coupled to the output of the feedback loop in the forward path of the feedback loop; at least one adjustable zero element (212, 213) coupled between the input of the feedback loop and the power amplifier; and at least one adjustable pole element (220, 221) coupled between the input of the feedback loop and the power amplifier, wherein the at least one adjustable zero element and at least one adjustable pole element are operable to change the loop bandwidth of the feedback loop. (Specification page 6, line 10 to page 7, line 11 and page 7, line 25 to page 10, line 19).

The invention, as defined in Claim 13 and by reference to FIGs. 5-7, is a method used in a feedback loop (200), the feedback loop comprising an input for receiving an input signal, an output for outputting a variable output signal, a power amplifier (231) coupled to the output of the feedback loop in a forward path of the feedback loop, at least one adjustable zero element (212, 213) coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop, and at least one adjustable pole element (220, 221) coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop, the feedback loop further having a loop and a closed loop frequency response associated with the forward path and a feedback path of the feedback loop, the loop frequency response having at least one pole and at least one zero and the closed loop frequency response being characterized by a closed loop bandwidth, the method comprising the steps of: moving a pole (715) in the loop frequency response using the at least one adjustable pole element yielding a change in the closed loop frequency response. (Specification page 11, line 1 to page 13, line 4 and page 14, line 21 to page 15, line 13).

The invention, as defined in Claim 20 and by reference to FIG. 2, is a feedback loop (200) having an input for receiving an input signal, an output for outputting a variable output signal and a loop bandwidth associated with a forward path and a feedback path of the feedback loop, the feedback loop comprising: a power amplifier (231) coupled to the output of the feedback loop in the forward path of the feedback loop; at least one adjustable zero element (212, 213) coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop; at least one adjustable pole element (220, 221) coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop; a first mixer (224, 225) in the forward path of the feedback loop coupled between the input of the feedback loop and the power amplifier; and a second mixer (252, 253) in the feedback path of the feedback loop coupled between the output of the feedback loop and the input of the feedback loop, wherein the at least one adjustable zero element and at least one adjustable pole element are operable to change the loop bandwidth of the feedback loop. (Specification page 6, line 10 to page 7, line 11 and page 7, line 25 to page 10, line 19).

The invention, as defined in Claim 22 and by reference to FIGs. 5-7, is a method used in a feedback loop (200), the feedback loop comprising an input for receiving an input signal, an output for outputting a variable output signal, a power amplifier (231) coupled to the output of the feedback loop in a forward path of the feedback loop, at least one adjustable zero element (212, 213) coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop, and at least one adjustable pole element (220, 221) coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop, the feedback loop further having a loop and a closed loop frequency response associated with the forward path and a feedback path of the feedback loop, the loop frequency

response having at least one pole and at least one zero and the closed loop frequency response being characterized by a closed loop bandwidth, the method comprising the steps of: moving a pole (715) in the loop frequency response using the at least one adjustable pole element yielding a change in the closed loop frequency response; and moving a zero (725) in the loop frequency response using the at least one adjustable zero element yielding a change in the closed loop frequency response. (Specification page 11, line 1 to page 13, line 4 and page 14, line 21 to page 15, line 13).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether Claims 1, 8, 9, 11, 18 and 20 are patentable under 35 U.S.C. 102(b) over Wessel, et al. (USPN 6,275,685)?

B. Whether Claims 2 and 4-6 are patentable under 35 U.S.C. 103(a) over Wessel, et al. as applied to Claim 1, and further in view of Cahill (USPN 5,287,556)?

C. Whether Claims 7 and 12 are patentable under 35 U.S.C. 103(a) over Wessel, et al. as applied to Claim 1, and further in view of Wray, et al. (USPN 5,467,055)?

D. Whether Claims 13-17 and 22 are patentable under 35 U.S.C. 103(a) over Wray, et al. in view of Wessel, et al.?

VII. ARGUMENT

A. Claims 1, 8, 9, 11, 18 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Wessel, et al. (USPN 6,275,685).

MPEP § 2131 provides:

> A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F. 2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim ....

Regarding Claims 1, 8, 9, 11, 18 and 20, the Examiner asserts that Wessel, et al. anticipates (i.e., discloses all elements of) Appellants' claimed invention (Office Action, May 17, 2006, pages 2-4). It is noted that the Examiner's reliance upon Wessel, et al. appears to be misplaced.

Described by Wessel, et al. is a linear amplifier arrangement that cancels distortion on a signal, wherein the distortion is generated in a power amplifier that amplifies the signal prior to it being transmitted (Abstract). The linear amplifier arrangement includes a power amplifier 22, an error detection subsystem 60 and an adaptive pre-distorter 70. In operation, the amplifier arrangement receives an input signal that is delayed in an element 14. The delayed input signal is modulated by a gain correction signal and a phase correction signal (both generated by the adaptive pre-distorter 70) to generate a pre-distorted signal that is input into the power amplifier 22. "The pre-distortion is such as to cancel . . . distortion of the power amplifier thus resulting in

an amplified output of improved spectral purity" (Abstract; FIG. 4; col. 2, line 24 to col. 3, line 3).

What is missing from this reference as recited in Claims 1 and 20 is "at least one adjustable zero element . . . [and] at least one adjustable pole element . . . wherein the at least one adjustable zero element and at least one adjustable pole element are operable to change the loop bandwidth of the feedback loop". The Examiner points to element 14 in FIG. 4 as being the at least one adjustable zero element, but element 14 is simply "a delay line" that delays the input signal to compensate for processing delays in generating the correction signals used to modulate the input signal (col. 6, lines 59-62). The Examiner appears to simply make a statement that Wessel, et al. includes an adjustable pole element without citing where this element is taught in the Wessel, et al. reference. Indeed, Applicants maintain that there is no such element disclosed in this reference. The Examiner further points to the pre-distorter 70 as reading on the limitations recited in Claims 1 and 20 of "wherein the at least one adjustable zero element and at least one adjustable pole element are operable to change the loop bandwidth of the feedback loop". However, the pre-distorter 70 does not operate to change the loop bandwidth of the feedback loop, but operates to change characteristics (i.e., gain and/or phase) of *an input signal* by generating gain and phase correction signals that are used to modulate the delayed input signal in order to produce the pre-distorted signal.

Therefore, since limitations are missing from the Wessel, et al. reference, a rejection of Claims 1, 8, 9, 11, 18 and 20 under 35 U.S.C. § 102(b) is improper and should be withdrawn.

B. Claims 2 and 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wessel, et al. as applied to Claim 1, and further in view of Cahill (USPN 5,287,556).

To establish a *prima facie* case of obviousness, and hence to find Claim 2 and 4-6 unpatentable under 35 U.S.C. § 103(a) over the combination of Wessel, et al. and Cahill, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all of the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not be based upon applicant's disclosure. MPEP at § 2142.

In the present case, all three criteria are not met because the combined teachings of Wessel, et al. and Cahill references do not teach or suggest all of the claim limitations of Claim 1. Applicants have set forth a number of limitations that are recited in Claim 1 and included by dependency in Claims 2 and 4-6, which are not disclosed in Wessel, et al. Applicants further submit that these limitations are also not disclosed in Cahill. Further to the Cahill reference, Applicants submit that the Examiner has mischaracterized this reference. This reference discloses a "radio receiver having a variable bandwidth received channel filter (113, 115) to reduce interference. . . The bandwidth of the filter is narrowed to improve BER [bit error rate]" and to thereby reduce interference (Abstract). The Examiner states that in col. 3, lines 5-50 Cahill discloses the limitations recited in Claim 1 and included by dependency in Claims 2 and 4-6 of "at least one adjustable zero element . . . [and] at least one adjustable pole element . . . wherein the at least one adjustable zero element and at least one adjustable pole element are

operable to change the loop bandwidth of the feedback loop". Applicants disagree. The only adjustable elements mentioned in this citation are the variable bandwidth filters 113 and 115. However, these elements do not operate as adjustable zero or pole elements but have a set number of poles and zeros. More particularly, Cahill states "received channel filters 113 and 115 are realized as lowpass variable passband filter having a *seven pole, one zero response*" (col. 3, lines 22-24, emphasis added).

Therefore, since limitations are missing from the Wessel, et al. and Cahill, et al. references, a rejection of Claims 2 and 4-6 under 35 U.S.C. § 103(a) is improper and should be withdrawn.

C. Claims 7 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wessel, et al. as applied to Claim 1, and further in view of Wray, et al. (USPN 5,467,055).

Applicants have set forth a number of limitations that are recited in Claim 1 and included by dependency in Claims 7 and 12, which are not disclosed in Wessel, et al. Applicants further submit that these limitations are also not disclosed in Wray, at al. More particularly, Wray, et al. discloses a power amplifier circuit that includes an amplifier control loop (or feedback element) providing negative feedback, and a loop closing element for selectively opening and closing the loop depending on the mode in which a radio that includes the circuit is operating. The power amplifier circuit further includes one or more gain elements external to the control loop that are adjusted to maintain approximately constant gain between the input and the output of the amplifier during opening and closing of the loop (Abstract; col. 2, lines 10-27). What is missing from Wray, et al. as recited in Claim 1 (and included by dependency in Claims 7 and 12) is "at least one adjustable zero element . . . [and] at least one adjustable pole element . . . wherein the at

least one adjustable zero element and at least one adjustable pole element are operable to change the loop bandwidth of the feedback loop". In fact bandwidth of the feedback loop is not even mentioned in this reference. The only characteristic of the feedback loop that is mentioned in Wray, et al. is the gain of the loop. However, this characteristic of the feedback loop is not changed by operation of any adjustable elements, but is set by the constant gain of the discreet elements of the circuit (*see* col. 3, lines 1-40).

Further to Claim 7, the Examiner admits that Wessel, et al. does not disclose a Cartesian feedback loop but states that Wray, et al. discloses this feature and that it would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the feedback loop of Wessel, et al. to include that the feedback loop is a Cartesian feedback loop since a Cartesian feedback loop is used to linearize the output of a power amplifier. Applicants disagree that such a modification would have been obvious.

If a proposed modification would render the prior art invention unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification and, thus, the teachings are insufficient to establish a *prima facie* case of obviousness. M.P.E.P. §2143.01. In this case, the Examiner's proposed modification of the Wessel, et al. invention to be a Cartesian feedback loop would render the invention unsatisfactory for its intended purpose. Wessel, et al. identifies four ways of linearizing a high power amplifier: direct RF feedback, envelop feedback (e.g., Cartesian), feed-forward and pre-distortion. The invention described in Wessel, et al. is a linearization technique that uses pre-distortion (Abstract; FIG. 4; col. 1, lines 4-5). Wessel, et al. further identifies the purpose of the invention of providing "an improved linear amplifier arrangement which achieves correction over a wide bandwidth" (col. 2, lines 14-17) and identifies implementation of pre-distortion as "inherently wideband" (col. 1, lines 66-

67). Modifying this pre-distortion circuit to include a Cartesian feedback method would render the circuit unsatisfactory to provide correction over a wide bandwidth because as explicitly stated in Wessel, et al., Cartesian feedback methods "is fundamentally limited in the correction bandwidth obtainable" (col. 1, lines 60-61). Therefore, "as systems migrate to wider band modulations . . . a linearization technology is required which is fundamentally a wideband technique" such as pre-distortion (col. 1, lines 62-65).

With further respect to Claim 12, the Examiner admits that Wessel, et al. fails to disclose "an adjustable first amplifier that amplifies an input signal to the adjustable zero element [and] a second amplifier that amplifies the input signal to the adjustable zero element" but states that Wray, et al. teaches these limitations. Applicants disagree since as explained above, Applicants believe that Wray, et al. fails to disclose an adjustable zero element that would require an input signal, amplified or otherwise.

Therefore, since limitations are missing from the Wessel, et al. and Wray, et al. references, and since it is not obvious to combine these references as the Examiner has suggested, a rejection of Claims 7 and 12 under 35 U.S.C. § 103(a) is improper and should be withdrawn.

D. Claims 13-17 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wray, et al. in view of Wessel, et al.

Regarding Claims 13 and 22, the Examiner identifies element 106 of FIG. 2 of the Wray, et al. reference as the "at least one adjustable zero element" in the forward path of the feedback loop, which is recited in these claims. Applicants disagree. Wray, et al. explicitly states that this is a "low pass filter" and does not teach or suggest that this filter is adjustable or contains a zero

element. All that this reference says about the characteristics of filter 106 is that it "is regarded as having negligible loss" (col. 3, lines 34-37). Further regarding Claims 13 and 22, the Examiner admits that Wray, et al. does not disclose "at least one adjustable pole element . . . [and] moving a pole in the loop frequency response using the at least one adjustable pole element yielding a change in the closed loop frequency response" as recited in these claims but argues that Wessel, et al. discloses these limitations. Applicants disagree based on their arguments above. Finally, regarding Claims 5 and 22, since Wray, et al. does not teach or suggest an adjustable zero element, it likewise fails to teach or suggest "moving a zero in the loop frequency response using the at least one adjustable zero element yielding a change in the closed loop frequency response" as is recited in these claims.

Therefore, since limitations are missing from the Wray, et al. and Wessel, et al. references, a rejection of Claims 13-17 and 22 under 35 U.S.C. § 103(a) is improper and should be withdrawn.

For the reason set forth above, Applicants submit that the Examiner has incorrectly rejected Claims 1, 8, 9, 11, 18 and 20 under 35 U.S.C. § 102(b) and Claims 4, 4-7, 12-17 and 22 under 35 U.S.C. § 103(a) and request that the Board withdraw the rejections.

Respectfully submitted,

Gailus, et al.

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VIII. CLAIMS APPENDIX

1. (previously presented) In an electrical device generating a variable output signal, a feedback loop for adjusting the variable output signal, the feedback loop having an input for receiving an input signal, an output for outputting the variable output signal and a loop bandwidth associated with a forward path and a feedback path of the feedback loop, the feedback loop comprising:

a power amplifier coupled to the output of the feedback loop in the forward path of the feedback loop;

at least one adjustable zero element coupled between the input of the feedback loop and the power amplifier; and

at least one adjustable pole element coupled between the input of the feedback loop and the power amplifier, wherein the at least one adjustable zero element and at least one adjustable pole element are operable to change the loop bandwidth of the feedback loop.

2. (previously presented) The feedback loop of claim 1 wherein the at least one adjustable zero element is in the forward path of the feedback loop.

3. (cancelled)

4. (previously presented) The feedback loop of claim 1 wherein the at least one adjustable pole element is in the forward path of the feedback loop.

5. (previously presented) The feedback loop of claim 4 wherein the at least one adjustable zero element is in the forward path of the feedback loop, the feedback loop further comprising:

a mixer in the forward path of the feedback loop coupled between the input of the feedback loop and the power amplifier; and

a mixer in the feedback path of the feedback loop coupled between the output of the feedback loop and the input of the feedback loop.

6. (previously presented) The feedback loop of claim 5, wherein:

the feedback loop is used as part of a radio transmitter.

7. (previously presented) The feedback loop of claim 1 wherein the feedback loop is a cartesian feedback loop.

8. (previously presented) The feedback loop of claim 1 wherein the adjustable pole element is a circuit comprising a plurality of elements having impedance that can be selectively coupled to the other elements of the circuit.

9. (previously presented) The feedback loop of claim 1 wherein the at least one adjustable pole element and the at least one adjustable zero element are substantially contained within an integrated circuit.

10. (cancelled)

11. (previously presented) The feedback loop of claim 1 wherein the at least one adjustable pole element comprises two adjustable pole elements.

12. (previously presented) The feedback loop of claim 1 in which the adjustable zero element comprises:

an adjustable first amplifier that amplifies an input signal to the adjustable zero element to create a first amplified signal;

a second amplifier that amplifies the input signal to the adjustable zero element to create a second amplified signal;

a low pass filter that operates on the first amplified signal to create a filtered amplified signal; and

a summer to add the filtered amplified signal and the second amplified signal to create an output signal to the adjustable zero element.

13. (previously presented) In a feedback loop comprising an input for receiving an input signal, an output for outputting a variable output signal, a power amplifier coupled to the output of the feedback loop in a forward path of the feedback loop, at least one adjustable zero element coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop, and at least one adjustable pole element coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop, the feedback loop further having a loop and a closed loop frequency response associated with the forward path and a feedback path of the feedback loop, the loop frequency response having at least one pole and at least one zero and the closed loop frequency response being characterized by a closed loop bandwidth, a method comprising the steps of:

moving a pole in the loop frequency response using the at least one adjustable pole element yielding a change in the closed loop frequency response.

14. (original) The method of claim 13 wherein the step of moving a pole is accomplished by switching among a plurality of elements having different impedances.

15. (previously presented) The method of claim 13 further comprising the step of:

moving a zero in the loop frequency response using the at least one adjustable zero element yielding a change in the closed loop frequency response.

16. (original) The method of claim 15 wherein the step of moving a zero is accomplished by adjusting an amplifier with an adjustable gain.

17. (previously presented) The method of claim 13 wherein the power amplifier amplifies the input signal so that it can be transmitted over a radio channel.

18. (previously presented) An integrated circuit implementing substantially all the components of a feedback loop with adjustable frequency response, the integrated circuit comprising the feedback loop of Claim 1.

19. (cancelled)

20. (previously presented) A feedback loop having an input for receiving an input signal, an output for outputting a variable output signal and a loop bandwidth associated with a forward path and a feedback path of the feedback loop, the feedback loop comprising

a power amplifier coupled to the output of the feedback loop in the forward path of the feedback loop;

at least one adjustable zero element coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop;

at least one adjustable pole element coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop;

a first mixer in the forward path of the feedback loop coupled between the input of the feedback loop and the power amplifier; and

a second mixer in the feedback path of the feedback loop coupled between the output of the feedback loop and the input of the feedback loop, wherein the at least one adjustable zero element and at least one adjustable pole element are operable to change the loop bandwidth of the feedback loop.

21. (cancelled)

22. (previously presented) In a feedback loop comprising an input for receiving an input signal, an output for outputting a variable output signal, a power amplifier coupled to the output of the feedback loop in a forward path of the feedback loop, at least one adjustable zero element coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop, and at least one adjustable pole element coupled between the input of the feedback loop and the power amplifier in the forward path of the feedback loop, the feedback loop further having a loop and a closed loop frequency response associated with the forward path and a feedback path of the feedback loop, the loop frequency response having at least one pole and at least one zero and the closed loop frequency response being characterized by a closed loop bandwidth, a method comprising the steps of:

moving a pole in the loop frequency response using the at least one adjustable pole element yielding a change in the closed loop frequency response; and

moving a zero in the loop frequency response using the at least one adjustable zero element yielding a change in the closed loop frequency response.

IX. EVIDENCE APPENDIX

No evidence has been submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132, entered by the examiner and relied upon by the appellant in the appeal, or relied upon by the examiner as to grounds of rejection to be reviewed on appeal.

X. RELATED PROCEEDINGS APPENDIX

No decisions have been rendered by a court of the Board in any proceeding identified pursuant to paragraph (c)(1)(ii) of 37 C.F.R. § 41.37.